Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Expanding Flexible Use in Mid-Band Spectrum Between 3.7 GHz and 24 GHz	)	GN Docket No. 17-183
	)	

COMMENTS OF GLOBALSTAR, INC.

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I. Introduction and Summary

Globalstar, Inc. ("Globalstar") hereby comments on the Commission's above-captioned Notice of Inquiry on expanding flexible terrestrial use of mid-band spectrum between 3.7 GHz and 24 GHz.[1] Globalstar appreciates and supports the Commission's ongoing effort to make additional spectrum available for next-generation wireless and mobile broadband applications, in order to meet the vast consumer demand for these services. Globalstar agrees with the Commission's goals of establishing sound and flexible spectrum policies, enabling innovation and investment, and maintaining U.S. leadership in next-generation wireless deployment.

With respect to mid-band spectrum blocks identified in the *NOI*, Globalstar believes that the Commission should focus on the 3.7-4.2 GHz band as the primary mid-band spectrum for the development and deployment of next-generation wireless broadband operations. This approach makes sense, given the Commission's existing wireless framework in the adjacent 3.5 GHz band and industry efforts already targeting this band for wireless broadband use. If the Commission is

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[1] *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Inquiry, 32 FCC Rcd 6373 (2017) ("*NOI*").

determined, however, to move forward with terrestrial wireless broadband development of mid-band spectrum at 6.425-7.125 GHz, it must ensure that Globalstar's licensed space-to-earth communications links at 6875-7055 MHz are fully protected from interference and are not subject to any disruptions or restrictions. These "feeder downlinks" between its mobile satellite service ("MSS") satellites and its gateway earth stations are a critical part of Globalstar's network architecture, conveying user traffic originating from Globalstar's end user devices into public wireline as well as wireless networks. Interference to these links would diminish the quality of Globalstar's services and could cause unacceptable harm to first responders, public safety personnel, consumers, and other customers who rely on Globalstar's satellite offerings.

Under any regulatory framework for terrestrial wireless operations at 6875-7055 MHz, Globalstar must be able to operate its licensed facilities to the full extent permitted under its authorizations and Part 25 regulations. The best approach for avoiding harmful interference to Globalstar's feeder downlinks would be for the Commission to establish sufficiently large circular "protection zones" around Globalstar's four existing domestic gateway earth stations and any future additional gateway facilities. In addition, if it allows flexible terrestrial spectrum use at 7 GHz, the Commission should adopt a non-exclusive licensing framework requiring registration of all individual fixed base stations and access points. Globalstar opposes unlimited, unlicensed operations at 6.425-7.125 GHz, because such operations would be difficult or impossible to control and would likely pose a substantial threat of harmful interference within gateway protection zones. Finally, the Commission should ensure that there is a reasonable and effective enforcement mechanism that requires wireless operators to mitigate any harmful interference to Globalstar and other incumbents in this band.

II. Globalstar and Its Global MSS Network

Globalstar's Satellite Business. Globalstar is a leading provider of global mobile satellite voice and data services. Globalstar is licensed for uplink transmissions (mobile earth stations to satellites) in the Lower Big LEO band at 1610-1618.725 MHz and for downlink transmissions (satellites to mobile earth stations) in the Upper Big LEO band at 2483.5-2500 MHz.[2] In 2013, Globalstar completed the launch of a $1 billion, second-generation non-geostationary ("NGSO") satellite constellation, and it continues to invest in ground infrastructure upgrades and an expanded line of enterprise, consumer, and government products.[3] With a fifteen-year design life, Globalstar's second-generation MSS system will support highly reliable, high-quality CDMA-quality voice and data satellite services to the millions of consumers, public safety personnel, and other potential customers covered by the new network beyond 2025. Overall, having invested more than $5 billion to date in its global MSS network, Globalstar uses its constellation of satellites and 23 ground stations on six continents to provide affordable, high-quality MSS to over 700,000 customers in over 120 countries around the world.

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[2] *Application of Loral/Qualcomm Partnership, L.P. for Authority to Construct, Launch, and Operate Globalstar, a Low Earth Orbit Satellite System, to Provide Mobile Satellite Services in the 1610-1626.5 MHz/2483.5-2500 MHz Bands*, Order and Authorization, 10 FCC Rcd 2333 (IB 1995) (DA 95-128); *see also Spectrum and Service Rules for Ancillary Terrestrial Components in the 1.6/2.4 GHz Big LEO Bands; Review of the Spectrum Sharing Plan Among Non-Geostationary Satellite Orbit Mobile Satellite Service Systems in the 1.6/2.4 GHz Bands*, Second Order on Reconsideration, Second Report and Order, and Notice of Proposed Rulemaking, 22 FCC Rcd 19733, ¶¶ 8, 18-20 (2007) (FCC 07-194). Iridium is authorized to share spectrum with Globalstar at 1617.775-1618.725 MHz.

[3] Globalstar launched its second-generation Big LEO satellites in a series of launches from October 2010 to February 2013, and all 24 of these satellites are now in service. In March 2011, the Commission authorized Globalstar's domestic gateway earth station facilities and mobile earth terminals to communicate with its second-generation Big LEO satellites. *Globalstar Licensee LLC, Application for Modification of Non-geostationary Mobile Satellite Service Space Station License; GUSA Licensee LLC, Applications for Modification of Mobile Satellite Service Earth Station Licenses; GCL Licensee LLC, Applications for Modification of Mobile Satellite Service Earth Station Licenses*, Order, 26 FCC Rcd 3948 (IB 2011) (DA 11-520) ("*March 2011 Modification Order*").

Since initiating commercial MSS in 2000, Globalstar has been dedicated to providing state-of-the-art, mission-critical, and safety-of-life services to consumers, businesses, and governmental and public safety users in remote, unserved, and underserved areas not reached by terrestrial deployments, both in the United States and globally.[4] Globalstar's MSS network will also continue to provide critical back-up capabilities virtually everywhere for public safety personnel during disasters when terrestrial networks can be rendered inoperable. In situations where all terrestrial facilities are down in an affected area, Globalstar's global MSS network will continue to function normally. For this reason, public safety entities involved in relief efforts in the United States and around the world have relied on Globalstar's satellite services after earthquakes, hurricanes, and other disasters.

Over the past several weeks, Globalstar's satellite services have played a critical role in sustaining communications capabilities for emergency and public safety personnel as well as citizens in areas affected by Hurricanes Harvey, Irma, and Maria. During this extraordinarily active hurricane season, Globalstar has maintained connectivity for its customers throughout the Gulf Coast and Caribbean regions. In preparation for Hurricane Irma's landfall, Globalstar transported duplex MSS phones to Florida and other likely affected areas. Globalstar experienced a sharp upsurge in usage before and after Hurricanes Irma and Maria. The post-hurricane increase in usage was greater than 50% for Hurricane Irma and more than 100% for Hurricane Maria.

As an example of the importance of Globalstar's services during this time, a Globalstar subscriber in Houston used his SPOT device (a one-way device discussed further below) to

[4] In addition to individual consumers, Globalstar's customers include entities in government, the military, emergency preparedness, transportation, heavy construction, oil and gas, mining, forestry, and commercial fishing.

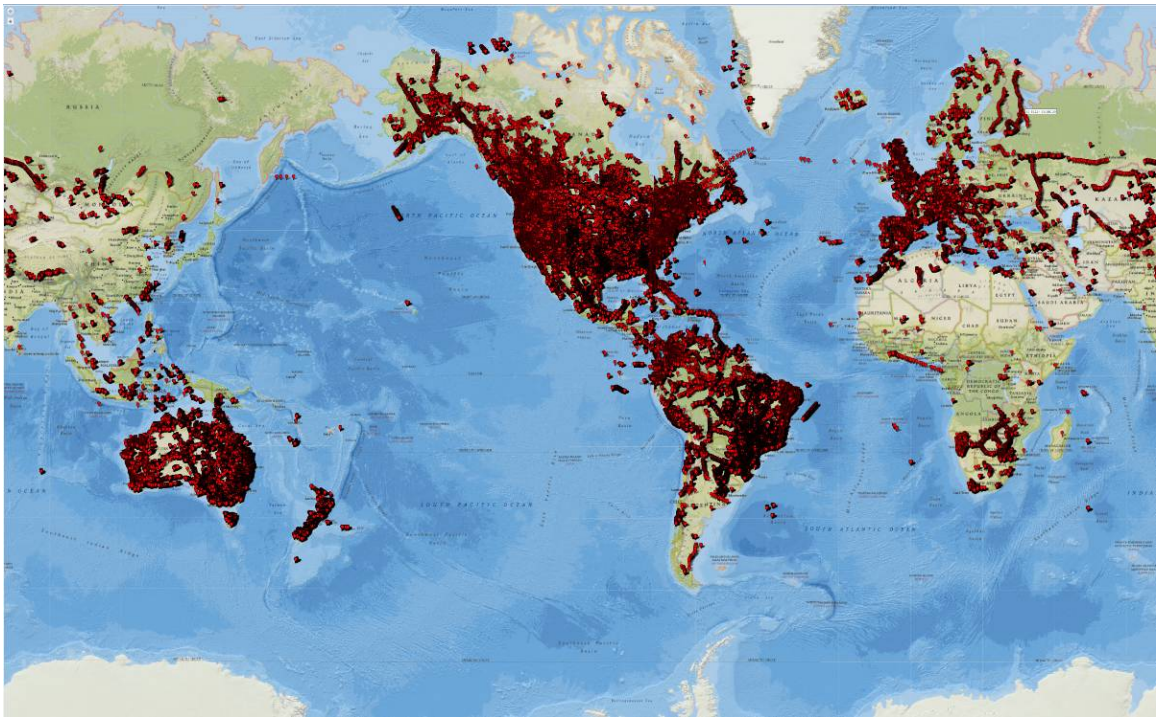
request emergency help after Hurricane Harvey when his boat capsized while he attempted to rescue others from an apartment complex in a flooded area. Responding to this SPOT transmission, public safety personnel who arrived on an air boat, resumed emergency efforts and rescued over 200 people, with no reported injuries. As another example, Globalstar has been facilitating the communications needs of Home Depot and Walmart, who are providing necessary supplies for relief efforts in areas affected by Hurricane Maria. In addition, Globalstar has supplied equipment and services to the Louisiana Governor's Office of Homeland Security and Emergency Preparedness for its disaster recovery mission to Puerto Rico. Globalstar has also donated voice and SPOT services to the Information Technology Disaster Resource Center, the nation's premier team of voluntary technology professionals who work to connect U.S. communities in crisis.

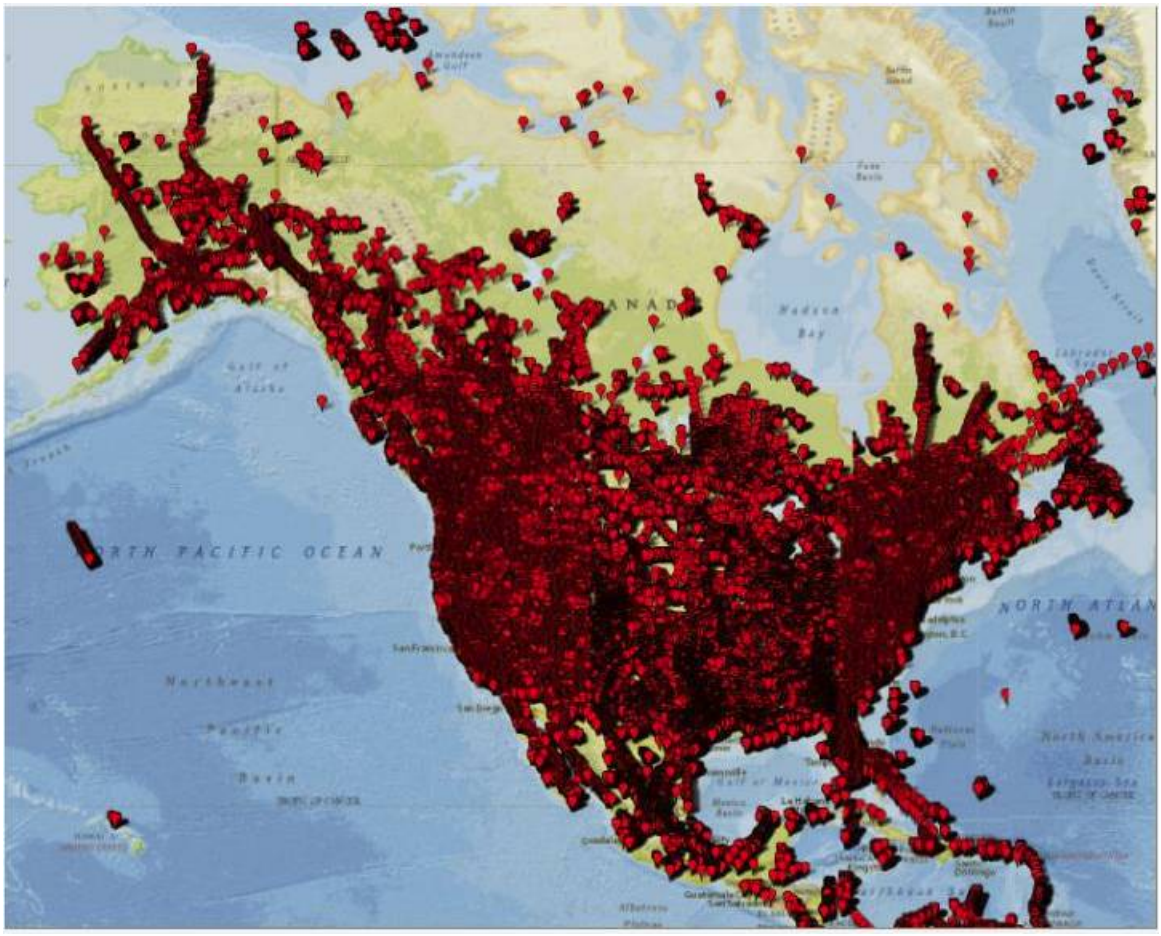
Over the past decade, Globalstar has focused on the development of affordable, consumer-oriented devices and services with significant public safety benefits. Globalstar has created an innovative, hand-held personal tracking and emergency messaging device by combining a GPS receiver with a multi-featured MSS L-band transmitter. Globalstar's consumer-oriented "SPOT" family of MSS devices has played a critical role in providing emergency and safety-of-life services to individual consumers beyond terrestrial wireless reach. From any location in Globalstar's global MSS footprint, SPOT devices can transmit a user's GPS coordinates and status updates to any e-mail, handheld device, or smartphone in the world. As of the date of this filing, the family of SPOT devices has been used to initiate over 5,300 emergency rescues, often life-saving, on land and at sea. So far in 2017, SPOT products have

been used to achieve 560 rescues, an average of approximately two per day.[5] Globalstar is unaware of any other satellite-based product that has achieved the remarkable life-saving record of the SPOT family of devices.

Overall, Globalstar's subscribers annually transmit more than one billion SPOT and other simplex messages over Globalstar's MSS network, and that figure continues to grow at a significant rate every year. Below, Globalstar provides two maps that show the volume of SPOT messages sent around the world during one day in September 2017, with a more detailed view of messages in North America. (Each red dot represents a separate message transmitted over Globalstar's MSS network on that day by a unit from the SPOT family of devices.) In addition, following the deployment of its second-generation constellation four years ago, Globalstar's network now carries substantial duplex voice and data traffic to and from its satellite customers.

[5] SPOT users either receiving assistance or helping to rescue others in need have included hikers, boaters, pilots, and remote workers. In September 2017 alone, specific examples of SPOT-initiated rescues include a hiker in Wyoming who sustained severe injuries during a grizzly bear attack and required helicopter transport to a nearby hospital, boaters whose yacht experienced a mechanical failure off the coast of Venezuela and were rescued by the Venezuela Coast Guard, two hunters in Sweden who became lost and were located by a dispatched helicopter, and a hiker in California who suffered potential compound fractures and head injuries and required an airlift to a regional medical center near Fresno.





Further, Globalstar is also dramatically expanding its international MSS business. For instance, on August 29, 2017, Globalstar announced the launch of its full suite of MSS offerings and products in Japan, having recently completed the MSS licensing process in that country.[6] Elsewhere, Globalstar is pursuing multiple international initiatives that will involve the deployment of new gateway infrastructure as it makes life-saving satellite services and applications available to the entire world.

In the near future, Globalstar will roll out its next-generation SPOT device providing "two-way" messaging capabilities in addition to its tracking and life-saving functions. Other new or upcoming Globalstar products include the next generation of Globalstar's "Sat-Fi" offering. Sat-Fi is a revolutionary voice and data technology that permits any Wi-Fi enabled device (*i.e.*, smartphones, tablets, laptops, etc.) to communicate over Globalstar's second-generation MSS constellation. In general, utilizing its second-generation constellation and ground facilities, Globalstar continues to provide the highest voice quality, fastest truly mobile data speeds, and most affordable service in the MSS industry.

Globalstar's Gateway Earth Station Infrastructure. Globalstar's gateway earth station facilities are an essential part of its global MSS network infrastructure. Globalstar's NGSO satellites currently communicate with 23 gateway earth stations around the world, each of which serves an area of approximately 700,000 to 1,000,000 square miles.[7] In order for Globalstar to provide services to an MSS subscriber, that customer must be within line-of-sight of a satellite and

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[6] Press Release, Globalstar, Inc., *Japan's MIC Publishes Radio Regulations to Support Globalstar Mobile Satellite Services in Japan* (Aug. 29, 2017), https://www.globalstar.com/en/index.php?cid=7010&pressId=976.

[7] Globalstar designed the planes in which its satellites orbit so that generally at least one satellite is visible from any point on the earth's surface between 70° north latitude and 70° south latitude.

that satellite must be within line-of-sight of a gateway earth station. Globalstar has positioned its gateways to enable its provision of MSS over most of the world's land area and population.[8]

Globalstar holds authority in the United States and elsewhere for the radiofrequency "feeder links" between its satellites and gateway earth station facilities. Specifically, Globalstar is authorized for "feeder uplink" transmissions between its gateway earth stations and space stations in the 5091-5250 MHz band and for "feeder downlink" transmissions from its satellites to its gateway facilities at 6875-7055 MHz.[9] In Globalstar's MSS architecture, its satellites' feeder downlink transmissions at 6875-7055 MHz convey all traffic originating from Globalstar's MSS simplex (one-way) and duplex (two-way) user devices over a radius of approximately 2900 km on the earth's surface. Globalstar's gateway earth stations receive, translate, amplify, and transmit this user-initiated traffic into the public switched telephone network ("PSTN"), to cellular or other wireless networks, or to the Internet, depending on the nature of the MSS customer's call and connection.

In the United States and its territories, Globalstar currently operates gateway earth stations in Texas, Florida, Alaska, and Puerto Rico.[10] In addition, on August 30, 2017, Globalstar announced a partnership with the University of Mississippi that will involve the deployment of a new gateway earth station at the site of a new science building on the Oxford, Mississippi campus.[11] This gateway facility will provide opportunities at the University for research, testing, and development of global communications technology. Globalstar anticipates

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8 Globalstar owns thirteen gateway earth stations, with the rest owned by inter-governmental organizations. Specifically, Globalstar owns and operates gateways in the United States, Canada, Venezuela, Puerto Rico, France, Brazil, Singapore, and Botswana.

9 *See March 2011 Modification Order* ¶¶ 2 n.1, 3.

10 Specifically, these gateways are located in Clifton, Texas; Sebring, Florida; Wasilla, Alaska; and Barrio of Las Palmas, Cabo Rojo, Puerto Rico.

11 Press Release, Globalstar, Inc., *University of Mississippi and Globalstar Announce Strategic Partnership* (Aug. 30, 2017), https://www.globalstar.com/en/index.php?cid=7010&pressId=977.

similar partnerships and gateway deployments in the future at other U.S. locations. Globalstar currently lacks gateway earth station facilities in Hawaii and Guam, and could fill those service gaps in the coming years with additional gateways. Globalstar may also deploy mobile gateway facilities in the future as a means of providing additional MSS capacity to its customers in regions where needed.

III. Any Commission Effort to Introduce Terrestrial Wireless Operations at 6.425-7.125 GHz Must Provide Full Protection to Globalstar's Feeder Downlink Operations at 6875-7055 MHz

Globalstar supports the Commission's expansion of the inventory of spectrum used for terrestrial broadband services. With this ongoing effort, the Commission can further its goals of achieving sound and flexible spectrum management, promoting innovation and investment, and preserving U.S. leadership in the development of next-generation wireless technology. Globalstar itself has worked in recent years to increase terrestrial use of its licensed Big LEO satellite spectrum, petitioning the Commission for more flexible terrestrial rules in this band in 2012 and just two months ago obtaining authority to provide terrestrial broadband services at 2483.5-2495 MHz.[12] In this licensed spectrum, Globalstar plans to deploy a small-cell, Time Division LTE (TD-LTE)-based network architecture that will be used to provide mobile and portable broadband services around the United States, including voice, data, and text

[12] *See* Petition for Rulemaking of Globalstar, Inc., RM-11685 (Nov. 13, 2012); Application for Modification of Globalstar Licensee LLC, IBFS File No. SAT-MOD-20170411-00061, Call Sign S2115 (filed Apr. 11, 2017; granted Aug. 8, 2017); Public Notice, *Satellite Policy Branch Information Action Taken*, Report No. SAT-01260, DA No. 17-756, at 1 (rel. Aug. 11, 2017); and Application for Modification of GUSA Licensee LLC, IBFS File No. SES-MOD-20170412-00422, Call Sign E970381 (filed Apr. 11, 2017; granted Aug. 11, 2017); *see also* Public Notice, *Satellite Communications Services Information re: Actions Taken*, Report No. SES-01982, at 5-7 (rel. Aug. 16, 2017). *See also Terrestrial Use of the 2473-2495 MHz Band for Low-Power Mobile Broadband Networks; Amendments to Rules for the Ancillary Terrestrial Component of Mobile Satellite Service Systems*, Report and Order, 31 FCC Rcd 13801 (2016) (FCC 16-181).

applications, to consumers, residences, commercial and industrial enterprises, public utilities, and government and public safety agencies.[13]

With respect to the mid-band spectrum blocks identified in the *NOI*, Globalstar believes that the Commission should focus on the 3.7-4.2 GHz band as the primary mid-band spectrum for the development and deployment of next-generation wireless broadband operations. This spectrum is directly adjacent to the 3.5 GHz band, for which the Commission has already adopted a regulatory framework for terrestrial wireless broadband operations.[14] These bands could potentially be combined under one unified regulatory framework. In addition, as the Commission points out in the *NOI*, the 3.7-4.2 GHz band has already been targeted by the industry for terrestrial wireless development in the United States and is the subject of two pending petitions for rulemaking.[15]

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[13] In addition, Globalstar in 2014 compromised with the cable industry and agreed to expanded wireless broadband use of its MSS feeder uplink spectrum at 5150-5250 MHz (the U-NII-1 band). *Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band*, First Report and Order, 29 FCC Rcd 4127 (2014). Since that order, however, Globalstar has accumulated evidence that unlimited wireless broadband use of the U-NII-1 band is causing harmful aggregate interference to Globalstar's MSS operations and that this interference is likely to have a significant detrimental impact on Globalstar's MSS network within the foreseeable future. Globalstar will soon request Commission action to address this threat of harm to Globalstar and its customers, including first responders, public safety personnel, and consumers around the United States.

[14] *Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Order on Reconsideration and Second Report and Order, 31 FCC Rcd 5011 (2016) ("*3550-3650 MHz Order*").

[15] *NOI* ¶¶ 7, 17; Petition for Rulemaking of Fixed Wireless Communications Coalition, Inc., RM-11778 (Oct. 11, 2016); Public Notice, *Consumer and Governmental Affairs Bureau Reference Information Center Petition for Rulemaking Filed*, Report No. 3059 (CGB rel. Dec. 9, 2016); Petition of Broadband Access Coalition for a Rulemaking to Amend and Modernize Parts 25 and 101 of the Commission's Rules to Authorize and Facilitate the Deployment of Licensed Point-to-Multipoint Fixed Wireless Broadband Service in the 3700-4200 MHz Band, RM- 11791 (June 21, 2017); Public Notice, *Consumer and Governmental Affairs Bureau Reference Information Center Petition for Rulemaking Filed*, Report No. 3080 (CGB rel. July 7, 2017).

If the Commission is intent, however, on moving forward with terrestrial wireless broadband development of mid-band spectrum at 6.425-7.125 GHz, it should ensure that Globalstar's existing, licensed feeder downlink operations at 6875-7055 MHz are fully protected from interference and are not subject to any disruptions or restrictions. As a general matter, Section 301 of the Communications Act protects licensed wireless operators from harmful interference.[16] If the Commission ultimately adopts a regulatory framework that allows terrestrial wireless operations at 6875-7055 MHz, Globalstar must be able to continue to operate its licensed facilities to the full extent permitted under its authorizations and Part 25 regulations.

Certainly, from an operational perspective, it is critically important that the Commission prevent terrestrial operations from causing harmful interference to Globalstar's feeder downlinks at 6875-7055 MHz. As indicated above, these feeder downlinks represent a crucial component of Globalstar's MSS network infrastructure. These downlinks transmit all user traffic emanating from Globalstar's MSS duplex and simplex devices in the United States to its four existing domestic gateway earth stations (as well as to any future additional gateways). Globalstar's duplex traffic includes life- and mission-critical communications during natural and manmade disasters, while Globalstar's simplex traffic includes life-critical emergency messaging and management-related transmissions. Globalstar's feeder downlinks also convey critical satellite system monitoring telemetry and command data necessary to maintain control and operation of its satellites. Any interference-related disruption to Globalstar's feeder downlinks communications, even for a short period, could have a significant, detrimental impact on Globalstar's customers as well as on its ability to properly control and maintain its satellite constellation. In the absence of effective regulatory protection, such interference could

16 47 U.S.C. § 301.

materially reduce the capacity and geographic reach of Globalstar's MSS network, diminish the quality of its services, and cause unacceptable harm to first responders, public safety personnel, consumers, and other customers who rely on Globalstar's MSS offerings.

Protection Zones for Globalstar MSS Gateways, Rather Than Use of SAS. If the Commission ultimately authorizes flexible terrestrial use of Globalstar's feeder downlink spectrum at 6875-7055 MHz, such operations will pose a substantial threat of harmful interference to Globalstar's MSS operations given the high-gain receive antennas employed at its gateways and the close proximity of these terrestrial operations relative to Globalstar's satellites. In this scenario, the best approach for avoiding harmful interference to Globalstar's feeder downlinks would be for the Commission to establish sufficiently large circular "protection zones" around Globalstar's four existing domestic gateway earth stations and any future additional gateway facilities. Within such protection zones, terrestrial wireless operations could only occur with Globalstar's consent, typically as the result of coordination discussions. This regulatory framework would be similar to the approach the Commission has taken in other primary satellite bands where it has decided to permit flexible terrestrial use.[17]

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[17] In recent years, the Commission has established protection zones for downlink gateway earth station operations in the 3.65 GHz band, the AWS-3 band, and the 39 GHz band. If the Commission expands terrestrial use into the 7 GHz band, the Commission should follow this approach. *See Wireless Operations in the 3650-3700 MHz Band; Rules for Wireless Broadband Services in the 3650-3700 MHz Band; Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band; Amendment of the Commission's Rules With Regard to the 3650-3700 MHz Government Transfer Band*, Report and Order and Memorandum Opinion and Order, 20 FCC Rcd 6502 (2005); *Amendment of the Commission's Rules with Regard to Commercial Operations in the 1695-1710 MHz, 1755-1780 MHz, and 2155-2180 MHz Bands*, Report and Order, 29 FCC Rcd 4610 (2014) ("*AWS-3 Order*"); *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services; Establishing a More Flexible Framework to Facilitate Satellite Operations in the 27.5-28.35 GHz and 37.5-40 GHz Bands; Petition for Rulemaking of the Fixed Wireless Communications Coalition to Create Service Rules for the 42-43.5 GHz Band; Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 to Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum*

In determining the size of Globalstar's gateway earth station protection zones, the Commission should consider a number of factors. First, the Commission should account for the NGSO characteristics of Globalstar satellites. Globalstar's gateway earth stations track its NGSO satellites as they move across the sky and, as a result, its gateway antennas must operate in a wide variety of azimuth directions. Effective interference prevention therefore requires larger protection zones for NGSO gateways than for geostationary earth stations, which transmit and receive in just a single azimuth direction. Another key variable in this analysis will be the technical rules for the terrestrial wireless operations at 6875-7055 MHz, including applicable power/EIRP limits and antenna height limits. Once these rules are in place, the Commission can assess likely aggregate signal levels from multiple terrestrial transmitters deployed in the geographic vicinity of Globalstar's gateway earth stations and incorporate this data into its protection zone determinations. In all of these calculations, the Commission should rely on sound propagation modeling and engineering methodologies, similar to the approach that yielded protection zones for federal earth station systems operating in AWS-3 spectrum at 1695-1710 MHz.[18]

If terrestrial operations are permitted at 6875-7055 MHz, the Commission should not only establish protection zones for Globalstar's four existing gateway earth stations, it should adopt procedures for determining appropriate protection zones for Globalstar's *future* gateway earth station deployments, such as its upcoming gateway in Oxford, Mississippi, and, potentially,

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Disaggregation Rules and Policies for Certain Wireless Radio Services; Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz and 48.2-50.2 GHz Frequency Bands; Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band; Allocation of Spectrum in the 46.9-47.0 GHz Frequency Band for Wireless Services; and Allocation of Spectrum in the 37.0-38.0 GHz and 40.0-40.5 GHz for Government Operations, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014 (2016) ("*Spectrum Frontiers Order*").

[18] *AWS-3 Order* ¶ 19 n.73.

additional gateways in Hawaii and Guam.[19] For instance, the Commission could require Globalstar to propose appropriate protection zones in its applications for authority for such future gateways, with those proposals then subject to notice and comment and a Commission decision on the precise protection contours.[20] In addition, any terrestrial flexible use framework at 7 GHz should account for Globalstar's potential deployment of mobile gateways in regions affected by disasters. The Commission must protect Globalstar's life-critical MSS network in emergency situations where it is needed most by citizens, first responders, and other public safety personnel.

In contrast to static protection zones for gateways, spectrum access systems do not represent an effective means of interference protection for Globalstar's feeder downlink operations at 6875-7055 MHz from interference. As a general matter, spectrum access systems remain an unproven interference protection mechanism for gateway earth station reception of satellite downlinks in the presence of wide scale, dynamic terrestrial wireless operations. As the Satellite Industry Association has stated, reliance on a spectrum access system ("SAS") to "dynamically assign spectrum and power levels to [devices] located inside the protection zones must be rejected as infeasible," since "existing technology does not provide the ability for an SAS to perform the complicated calculations of aggregate interference in real time in an

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[19] In addition to enjoying interference protection for new gateway earth stations, the Commission's rules should enable Globalstar to modify and replace its existing gateway earth station facilities as needed to optimize its global MSS operations.

[20] In its July 14, 2016 *Spectrum Frontiers Order*, the Commission directed applicants for FSS earth station authority in the 39 GHz band to propose reasonable protection zones in their earth station applications. Each FSS applicant is required to define a protection zone around its earth station where no terrestrial operations may be deployed, and must coordinate with terrestrial fixed and mobile licensees whose license areas overlap with the protection zone, in order to ensure that the zone does not encompass existing terrestrial operations. *Spectrum Frontiers Order* ¶ 93.

environment where the number and location of active [devices] would be constantly changing."[21] It would be particularly difficult for an SAS to operate successfully at 6875-7055 MHz given the highly dynamic nature of Globalstar's gateway earth stations, which, as indicated above, employ satellite tracking antennas to communicate with Globalstar's NGSO satellites. Each Globalstar satellite is tracked by a Globalstar gateway for approximately fifteen minutes as it moves across the sky from horizon to horizon.[22] In addition, each successive satellite crosses the sky in a different path than the previous satellite, meaning that the tracking direction of each gateway antenna also changes every fifteen minutes. Given current technology, it is unlikely that an SAS can adequately protect earth station operations from nearby terrestrial wireless transmissions in such a complex radiofrequency environment.

Even if SAS operations are appropriate in the 3.5 GHz band (where the Commission mandated the use of an SAS),[23] SAS deployment would constitute an unnecessarily complicated approach to spectrum management in the 7 GHz band, given the limited quantity of gateway

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21 Reply Comments of the Satellite Industry Association, GN Docket No. 12-354, at ii, 19 (Aug. 15, 2014). *See also* Reply Comments of AT&T, GN Docket No. 14-177, at 18 (Oct. 31, 2016) ("The novel SAS model adopted at 3.5 GHz has not even been tested, much less proven to effectively manage spectrum allocation and interference coordination."); Reply Comments of T-Mobile, GN Docket No. 14-177, at 20 (Oct. 31, 2016) ("An SAS is untested, overly complicated and unnecessary."); Reply Comments of Nextlink Wireless, LLC, GN Docket No. 14-177, at 24-25 (Oct. 31, 2016) ("[M]ore reliable and tested methods such as coordination and exclusion zones and prior coordination notices or pre-defined geographic areas available for shared access are preferable to dynamic sharing through a SAS model."); Comments of AT&T, GN Docket No. 14-177, at 11-12 (Sep. 30, 2016) ("[W]here sharing is required, the Commission should not view Spectrum Access System ('SAS') concepts as a panacea. While the SAS concept has been portrayed as a technological enabler, the reality is that the model is still untested, and there are already significant issues coming to the fore as industry struggles with SAS implementation for the 3.5 GHz band. Instead, the Commission should look to tested industry/government sharing models – including . . . the use of coordination and preclusion zones.").

22 Each Globalstar satellite takes approximately 114 minutes to orbit the earth.

23 *3550-3650 MHz Order, supra* note 14.

earth stations in this portion of mid-band spectrum. Unlike an approach involving fixed protection zones for a small number of earth stations, reliance on SAS technology would likely impose undue regulatory and administrative burdens on wireless service providers, Globalstar, and other satellite licensees, including overly onerous interference reporting obligations and the need for licensees to continually update an SAS database with their current operating parameters.

Non-Exclusive Licensing with Registration Framework, Rather Than Unlicensed. In the *NOI*, the Commission also asks if the 6.425-7.125 GHz band or specific subsets of that band would "be a viable expansion opportunity for U-NII-1 or for other unlicensed operations."[24] Globalstar opposes unlimited, unlicensed operations under Part 15 at 6.425-7.125 GHz, including in Globalstar's feeder downlink spectrum at 6875-7055 MHz. If the Commission opens up this spectrum to unlicensed systems and devices, it would be extremely difficult or even impossible to prevent unlicensed operations within Globalstar gateway protection zones, or to terminate such operations in new protection zones associated with Globalstar's future gateway deployments. Uncontrolled unlicensed operations in these areas would pose a substantial threat of harmful interference to Globalstar's MSS operations.

If the Commission allows flexible terrestrial spectrum use at 7 GHz, it should adopt a non-exclusive licensing framework requiring registration of all individual fixed base stations and access points, rather than permit unlimited unlicensed operations in this band. Globalstar would support such a framework that (1) limits licensing eligibility to qualified terrestrial wireless operators, who typically enjoy effective control over their networks, and (2) enables those wireless operators to obtain nationwide, non-exclusive licenses authorizing them to register and

[24] *NOI* ¶ 36.

deploy fixed access points and other wireless systems used to provide service to end users.[25] In registering these facilities, wireless service providers would provide technical and operational information regarding all of their fixed transmitters, including location, frequencies used, bandwidth, antenna height and gain, and EIRP.

Globalstar believes that wireless operators would be in the best position to comply with the Commission's technical requirements at 7 GHz and protect incumbent operations from harmful interference. Operators' control of their networks should enable them to minimize wireless transmissions within earth station protection zones and coordinate terrestrial operations with those gateways as necessary. This non-exclusive approach would also facilitate effective enforcement by enabling the Commission to identify the parties responsible for mitigating interference to satellite operations. Overall, these eligibility and registration requirements would enable the Commission to monitor the development and use of this mid-band spectrum and safeguard Globalstar's MSS feeder downlink operations. This outcome is far preferable to an uncontrolled, unlimited proliferation of unlicensed devices at 7 GHz.[26]

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[25] In this scenario, the Commission should not make these non-exclusive, nationwide licenses available to individual households or businesses seeking to use the 7 GHz band for personal or internal business purposes.

[26] This licensing and registration framework would be similar to the approach taken by Innovation, Science, and Economic Development Canada with respect to the deployment of higher power and outdoor access points operating in the 5150-5250 MHz band, where Globalstar's feeder uplink facilities currently operate in the United States, Canada, and elsewhere. *See Decision on the Technical and Policy Framework for Radio Local Area Network Devices Operating in the 5150-5250 MHz Frequency Band*, Innovation, Science and Economic Development Canada, SMSE-013-17 (May 2017), https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/SMSE-013-17-decision-5150-eng.pdf/$file/SMSE-013-17-decision-5150-eng.pdf. *See also Wireless Operations in the 3650-3700 MHz Band; Rules for Wireless Broadband Services in the 3650-3700 MHz Band; Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band; Amendment of the Commission's Rules With Regard to the 3650-3700 MHz Government Transfer Band*, Report and Order and Memorandum Opinion and Order, 20 FCC Rcd 6502 (2005).

Enforcement of Prohibition Against Harmful Interference. Finally, as part of any non-exclusive licensing and registration framework at 7 GHz, the Commission should ensure that there is a reasonable and effective enforcement mechanism that requires wireless operators to mitigate any harmful interference to Globalstar and other incumbents in this band. If Globalstar experiences feeder downlink interference at its gateways, terrestrial wireless operators in that area must have the responsibility to determine if they are the cause of that interference, and, if so, to power down, relocate, or terminate their operations in order to eliminate that interference within a commercially appropriate timeframe. More generally, terrestrial wireless operators at 7 GHz, Globalstar, and other incumbents should all be obligated to work cooperatively toward commercially reasonable resolutions of such interference issues.

IV. Conclusion

Globalstar supports the Commission's ongoing effort to free up additional spectrum for next-generation wireless and mobile broadband applications in order to meet the enormous consumer demand for these services. Under any regulatory framework for terrestrial wireless operations in the 7 GHz band, however, Globalstar must be able to operate its licensed feeder downlinks at 6875-7055 MHz to the full extent permitted under its authorizations and Part 25 regulations. The best means of protecting Globalstar's gateways from harmful interference is to establish circular protection zones for its existing and future gateway earth stations, and to adopt non-exclusive licensing with an equipment registration requirement. The Commission should

also ensure that there is a reasonable and effective enforcement mechanism that requires wireless operators to mitigate any harmful interference to Globalstar and other incumbents in this band.

Respectfully submitted,

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